Joanna Papiernik

Uniwersytet Łódzki, Katedra Historii Filozofii

HOW TO MEASURE DIFFERENT MOVEMENTS? THE 14TH-CENTURY TREATISE *DE SEX INCONVENIENTIBUS**

One of the main interests of the Oxford Calculators, a group of intellectuals[1] from the fourteenth century, was the Aristotelian natural philosophy (with Averroes' interpretation) to which — and this is a characteristic and innovative aspect of this school — they introduced mathematics, and more specifically, the Euclidean-Eudoxean calculus of ratios. As it is well known, among the concepts inseparably connected to the Stagirite's notion of "nature" is "movement",[2] broadly understood as any change, and in the analyses of the Calculators this particular concept plays an important role. All these philosophers dedicate quite a significant part of their philosophical activity to the use of logical and mathematical tools in considerations concerning various types of changes. This is also the case of the anonymous treatise *De sex inconvenientibus*: the whole text deals with different ways of measuring changes such as: generation, alteration, augmentation and local movement. The purpose of this article is threefold: (1) to

---

[1] The following belonged to the Oxford Calculators School: Thomas Bradwardine (ca. 1295–1349), Richard Kilvington (1302/1303–1361), William Heytesbury (1313–1372/1373), John Dumbleton (ca. 1310 – ca. 1349), Roger Swineshead (ca. 1310 – ca. 1365), Richard Swineshead (fl. ca. 1340–1355). The name comes from the nickname of Richard Swineshead: "Calculator", which was supposed to indicate the use of the calculus of ratios in various philosophical fields and in theology. References to the most important works of Calculators can be found, for example, in: E. Jung, *Arystoteles na nowo odczytany. Ryszarda Kilvingtona "Kwestie o ruchu"*, Łódź: Wydawnictwo Uniwersytetu Łódzkiego, 2014, p. 28; this work is available online: http://repozytorium.uni.lodz.pl:8080/xmlui/bitstream/handle/11089/23302/Jung_Arystoteles_%c5%9aRODKI.pdf?sequence=1&isAllowed=y

[2] Cf. e.g. Aristoteles, *Physica*, III, 200b12-15, translatio vetus, edd. F. Bossier, J. Brams, Leiden – New York: E. J. Brill, 1990.

show the actual content and structure of the treatise;[3] (2) to present some philosophical inspirations for the treatise and provide some remarks on the dependence of the author on his predecessors who dealt with issues related to movements; (3) to explain the most appropriate *modi procedendi* in calculations of speed[4] in the calculation of different movements.

The treatise *De sex inconvenientibus*,[5] although its author is unknown, most probably belonged to the milieu of the Calculators.[6] He takes up the problems with defining speed for the different categories of movement so popular among the aforementioned group and solves them using procedures characteristic for this school. This text is very important in the history of the development of mathematical physics in the Late Middle Ages, as it can be considered as a kind of link between the achievements of the older Calculators (e.g. Richard Kilvington or William Heytesbury) and the compendium of knowledge of the whole

---

[3] In the literature on this treatise (also, in some relatively recent texts) one can find information that there are no sources containing the entire work. However, it seems that four manuscripts and one printed in the 16th century edition provide the whole content of the *De sex inconvenientibus*. I explain it more broadly below.

[4] I follow the traditional way of translating "velocitas" as "speed". On this problem see e.g. J. Celeyrette, "Bradwardine's Rule: A Mathematical Law?," *Mechanics and Natural Philosophy before the Scientific Revolution*, ed. W.R. Laird, S. Roux, (Boston Studies in the Philosophy and History of Science, 254), Dordrecht: Springer, 2008, p. 56.

[5] The secondary literature concerning the treatise is scarce. This work is mentioned several times by Pierre Duhem, most extensively in his: *Études sur Léonard de Vinci*, vol. 3, Paris: Hermann, 1913, pp. 420–424, 471–474; and "La dialectique du Oxford et la Scolastique italienne," *Bulletin Italien*, vol. 12 (1912), pp. 22–26, 101–103, 289–292. Beside this author, some problems taken up in the treatises were discussed in: S. Caroti, "Da Walter Burley al 'Tractatus de sex inconvenientibus'. La tradizione inglese della discussione medievale 'De reactione'," *Medioevo. Rivista di Storia della Filosofia Medievale*, vol. 21 (1995), p. 257–374; G. Fernández Walker, "A New Source of Nicholas of Autrecourt's Quaestio: The Anonymous 'Tractatus de sex inconvenientibus'," *Bulletin de Philosophie Médiévale*, vol. 55 (2013), p. 57–69; S. Rommevaux, "Six inconvénients découlant de la règle du mouvement de Thomas Bradwardine dans un texte anonyme du XIVe siècle," *L'homme au risque de l'infini: Mélanges d'histoire et de philosophie des sciences offerts à Michel Blay*, ed. M. Malpangotto, V. Jullien, E. Nicolaïdis, (De diversis artibus, 93), Turnhout: Brepols Publishers, 2013, p. 35–47; eadem, "Un auteur anonyme du XIVe siècle, à Oxford, lecteur de Pierre de Maricourt," *Revue d'Histoire des Sciences*, vol. 61/1 (2014), p. 5–33; J. Papiernik, "Metody matematyczne w badaniach z zakresu filozofii przyrody. Problem szybkości powstawania form w XIV-wiecznym traktacie 'De sex inconvenientibus'," *Przegląd Tomistyczny*, vol. 23 (2017), p. 95–145.

[6] According to Duhem (*Études sur Léonard de Vinci*, p. 423), the author of the *De sex inconvenientibus* might have been Heytesbury's student, because in the third question of the treatise he writes: "unus sollempnis magister, potissimus et famosus Hethysbyry" (all quotations come from ms Paris, BNF, lat. 6559, the cited fragment is on f. 22va–b). Similarly, it is supposed by A. Maier in: *Studien zur Naturphilosophie der Spätscholastik*, vol. 1: *Die Vorläufer Galileis and 14 Jahrhundert*, (Storia e Letteratura. Raccolta di Studi e testi, 22), Roma: Edizioni di Storia e Letteratura, 1949, p. 96.

group, i.e. *Summa logicae et philosophiae naturalis* written by John Dumbleton. In recent years, research on Oxford's philosophy of nature has deepened: as part of a scientific project, critical editions of the Calculators' works on local motion are being prepared.[7] The critical edition of the fourth question of the *De sex inconvenientibus* and the translation of the whole work into Polish is being prepared by Prof. Elżbieta Jung and Dr Joanna Papiernik. Dr Sabine Rommevaux is working on a critical edition of the whole treatise.[8]

The work is only available in a form of an old-print or a manuscript. It was edited in Venice in 1505, together with works by several other natural philosophers[9] and it can be found in the manuscripts: Paris, Bibliothèque Nationale, ms. 6559[10] and 6527;[11] Venezia, Biblioteca Marciana, lat. VIII. 19;[12] Oxford, Bodleian Library, Canon. Misc. 177;[13] Roma, Biblioteca Apostolica Vaticana, Vat. lat. 3026 (this manuscript contains two short fragments of the treatise: the

---

[7] The project *Towards the Modern Natural Philosophy: The Mathematization of Aristotle's Physics in the School of Oxford Calculators* is managed by Prof. Elżbieta Jung.

[8] Dr Sabine Rommevaux-Tani works at Le Centre national de la recherche scientifique: http://www.sphere.univ-paris-diderot.fr/spip.php?article393&lang=fr

[9] This edition will not be the basis for reading the text of the treatise, because it is full of errors and omissions. The collection contains also: *Questio de modalibus* Bassani Politi. *Tractatus proportionum introductorius ad calculationes Suisset. Tractatus proportionum* Thome Braduardini. *Tractatus proportionum* Nicholai Oren. *Tractatus de latitudinibus formarum* eiusdem Nicholai. *Tractatus de latitudinibus formarum* Blasii de Parma. On the 74th folio of this edition two other texts are mentioned: *Questio subtilis doctoris Johannis de Casali De velocitate motus alterationis* and *Questio Blasii de Parma de tactu corporum durorum* — they are both included in the volume.

[10] The treatise is on ff. 1ra–42va. Inc.: "Utrum in generatione formarum sit certa ponenda velocitas. Circa propositam questionem et cetera dubia disputanda de proportionibus velocitatum in motibus." Expl.: "...et sic patet ad utrumque: ad quintum videlicet et ad sextum. Et est finis quarte questionis, que est de proportione velocitatum in motu locali."

[11] The *De sex* is contained on ff. 131ra–169vb. Inc.: "Utrum in omni generatione formarum sit certa ponenda velocitas. Circa propositam questionem et cetera dubia disputanda de proportionibus velocittatum..." Expl.: "Et sic patet responsio ad utrumque: ad quintum similem ad sextum. Et est finis quarte questionis, que est de proportione velocitatum in motu locali. Deo gratias. Amen. Explicit tractatus de sex inconvenientibus. Finito libro sit laus et gloria Cristo. Dabitur pro penna scriptori pulchra puella."

[12] The *De sex* is contained on ff. 65v–145v. Inc.: "Utrum in generatione formarum sit certa ponenda velocitas. Circa propositam questionem et cetera dubia disputanda de proportionibus vlocitatum in motibus...". Expl.: "Et patet utrumque: ad quintum et ad sextum, patet quod sit dicendum. Et est finis quarte questionis, que est de proportione velocitatum in motu locali, etc. Et est finis operis, mercedem posco laboris."

[13] The *De sex* is contained on ff. 182va–212va. Inc.: "Utrum in generatione formarum sit certa ponenda vellocitas. Circa propositam questionem et circa dubia disputanda de proportionibus vellocitatum...". Expl.: "...et sic patet ad utrumque: ad quintum et ad sextum. Et sic est finis quarte questionis, que est de proportione velocitatum in motu locali. Deo altissimo refferens gratias. Anno Christi 1404 die 18 octubris in die beati Luce, dum magna regnaret guera inter dominium Venetiarum et dominum Francesscum [de] Chraria [i.e. Carrara] dominum Padue et

first one finishes on the third *inconveniens* of the second article of the first question; the second one ends on the second *inconveniens* of the first article of the first question);[14] Prague, Národní knihovna České republiky, VIII. G.19 (in this manuscript the text finishes at the end of the second article of the fourth question);[15] Kraków, the Jagiellonian Library, ms. 739 (in this manuscript the text finishes at the first *inconveniens* of the second article of the fourth question).[16] Although the exact date of the origin of the *De sex inconvenientibus* has not been established, it was most likely written in the first half of the 14th century.[17]

Marchionem Extenssem [Nicolaum III] (?) dominum Ferarie, complevi hoc scribere ego Donatus de Monte."

[14] Here the situation is unusual, because there are two fragments of the anonymous treatise in different parts of the manuscript. The first fragment is on ff. 17r–20v. The top margin contains the title of the text: "Incipit tractatus magistri sex inconvenientium summus in philosphia naturali, cuius anima requiescat in pace. Amen." Inc.: "Incipitur tractatus sic. Prima questio: utrum in generatione formarum sit certa servanda vellocitas…" Expl.: "Aliquando movetur ad subrubeum, croceum, deinde ad rubeum, deinde ad purpureum, deinde in viride et sic sit nigrum. Tertio modo pervenit viride…" On the bottom margin: "clarum deinde pervenit"; Ibidem, ff. 121v–124v; Inc.: "Utrum in generatione formarum sit certa ponenda vellocitas. Circa presentem questionem et circa dubia disputanda de proportionibus velocitatum..." Expl.: "...et tamen *a* infinite vellocius, etc., quod arguo sic: quia *a* namque deveniet ad locum suum naturalem, pertransiet spacium infinitum, quia..."

[15] The fragment of the *De sex* is on ff. 25r–46v. Inc.: "Utrum in omni generatione formarum sit ponenda velocitas. Circa propositam questionem ac circa dubia disputanda de proportionibus velocitatum in motibus ..." Expl.: "... et totum pertransitum ab *a* ante finem hore et sic non sequitur inconveniens adductum et probatio claret. Patet quia in eodem casu ad alia sic dicendum. Expliciunt questiones de motu Parisius(?) disputate." In this manuscript the third article and the answer to the main question on the local motion are omitted.

[16] The fragment of the *De sex* is on ff. 1ra–8vb. Inc.: "Utrum in generatione formarum sit aliqua ponenda velocitas. Circa propositam questionem sicut dubia disputanda de proportione velocitatum in motibus..." Expl.: "et signatur *c* punctum ab *a* per radium procedentem a medio puncto *a* corporis luminosi in continuum et directum super *c* punctum." The text is interrupted in the middle of the reasoning.

[17] J. Celeyrette ("Bradwardine's Rule," p. 58) writes that the treatise was composed at the end of the fourth or at the beginning of the fifth decade of the 14th century. He indicates that Thomas Bradwardine and William Heytesbury are cited in the work, and the *De sex* itself is cited by John Dumbleton. The information that Dumbleton quotes the treatise in his *Summa de logicis et naturalibus* is also given by M. Clagett in: *Nicole Oresme and the Medieval Geometry of Qualities and Motions: A Treatise on the Uniformity and Difformity of Intensities Known as "Tractatus de configurationibus qualitatum et motuum"*, Madison: The University of Wisconsin Press, 1968, p. 619 (see: S. Rommevaux-Tani, "La détermination de la rapidité d'augmentation dans le 'De sex inconvenientibus': comparaison avec les développements sur le même sujet de William Heytesbury," *Miroir de l'amitié: mélanges offerts à Joël Biard*, ed. Ch. Grellard, Paris: Vrin, 2017, p. 153). Although it is not known when exactly the *De sex* was written, the date of its origin can be significantly narrowed down, taking into account the years of intellectual activity of Bradwardine and Heytesbury — more specifically, the *De sex* several times mentions *Tractatus de proportionibus* by the first of the aforementioned philosophers (written in 1328) and *Regulae solvendi sophismata*

The *De sex inconvenientibus* consists of four main questions and each of them contains three complementary articles. According to Pierre Duhem, The *De sex inconvenientibus* contains eleven questions and both Parisian manuscripts 6559 and 6527 are incomplete.[18] The famous French physicist concludes this from the fact that the list on ff. 194v of ms. 6559 enumerates eleven questions, but he does not explain why he assumes that the list encloses only the questions of the *De sex*, it is not entitled in any way. The fourth and — in my opinion — last question of the anonymous treatise finishes in ms. 6559 on f. 41va with these words: "et est finis quarte questionis, que est de proportione velocitatum in motu locali" and there is some empty space between these words and the end of the column. Indeed, on the ff. 41vb a new question begins: "Utrum celum possit suo motu et lumine inferiora corpora transmutare," but its structure and the construction of arguments are completely different from the ones employed in the *De sex* (it is written by the same hand, but it is completely different from the previous parts of the work, e.g. it does not contain six *inconvenientia*). It is worth noticing that also in ms. 6527 (ff. 131ra–169vb) there are the same (as in ms. 6559) four questions and on ff. 170r they are listed in the index entitled *Incipit tabula questionum inconvenientium*. As Duhem remarks, in this *tabula* questions and articles have the same status and in the catalogue of the Latin manuscripts of the Bibliothèque Royale the title of the treatise reads: *Tractatus de sexdecim inconvenientibus*, but he does not assume that this may be a complete list of the content of the treatise. The French researcher is of the opinion that a scribe ended his work on the fourth question, not wanting to include a further, incomplete part in the manuscript (i.e. a fragment of the alleged fifth question), but this assumption is made because of the conviction that the list from ms. 6559 is the point of reference for the whole text of the treatise. The author of the *Études sur Léonard* also mentions an old-print edition of the *De sex*, but he does not provide information as to whether he was acquainted with it; and this version of the work contains the four questions too. What is more, Duhem does not refer to ms. Venezia, Biblioteca Marciana, lat. VIII. 19; Oxford, Bodleian Library, Canon. Misc. 177, and the *De sex* in these codices also consists of the four main questions. It is also worth stressing that on f. 212vb in the Bodleian manuscript there is a list of sixteen questions of the treatise,

---

by the second of them (in 1335). What is more, Dumbleton's work was written between 1338 and 1348 (see: J. Celeyrette, E. Mazet, "Le mouvement du point de vue de la cause et le mouvement du point de vue de l'effet dans le 'Traité des rapports' d'Albert de Saxe," *Revue d'Histoire des Sciences*, vol. 56/2 [2003], p. 436.). Thus, the *terminus post quem* of the *De sex inconvenientibus*' creation is the year 1335, and the *terminus ante quem* — 1348. G. Fernández Walker ("A New Source of Nicholas of Autrecourt's Quaestio," p. 60) writes that *Summa* could have been written even earlier, before 1344.

[18] P. Duhem, *Études sur Léonard de Vinci*, p. 421.

just like in the ms. 6527, both the *quaestiones* and the *articuli* have the same status, but still — they are the same constituents of the treatise, as the ones found in two Parisian and the Venetian manuscripts. Finally, the body of the work can easily be concluded from the beginning of the text, where the author clearly announces the topics of his considerations and they are all included in the sources: (6559 [see footnote 6] f. 1ra) "Utrum in generatione formarum sit certa ponenda velocitas. Circa propositam questionem et cetera dubia disputanda de proportionibus velocitatum in motibus generationis, alterationis, augmentationis ac motu locali presentem servabo processum. In primis, ut potero, disputabo materias antedictas, deinde materias illas tradam per modum tractatus."[19] The structure of the work embraces:

QUESTION I

> On generation (*De generatione*): *Should specific speed be measured in the generation of forms?* (*Utrum in generatione formarum sit certa ponenda velocitas*).

ARTICLES:

1. *Does the generating factor give as much from the place as from the form?* (*Utrum generans tantum loci contribuat quantum forme*).
2. *Are the intermediate colors generated from the extreme colors?* (*Utrum ex coloribus extremis intermedii generentur colores*).
3. *Do the celestial bodies generate primary qualities through light?* (*Utrum celestia corpora generent qualitates primarias lumine mediante*).

QUESTION II

> On motion of alteration (*De motu alterationis*): *Should acceleration and slowness be measured in motion of alteration?* (*Utrum in motu alterationis velocitas sit signanda vel tarditas*).

ARTICLES:

1. *Is a magnet able to change a piece of iron placed next to it?* (*Utrum magnes suppositum sibi ferrum sufficiat alterare*).

---

[19] On this issue, see also: S. ROMMEVAUX, "Un auteur anonyme du XIVe siècle," p. 7–8; J. PAPIERNIK, "Metody matematyczne w badaniach z zakresu filozofii przyrody," p. 96–98, and G. FERNÁNDEZ WALKER, "A New Source of Nicholas of Autrecourt's Quaestio," p. 59–63. G. Fernández Walker is of the opinion that the majority of the treatise is lost and — on the basis of Z. Kałuża's description of ms. 6559 (Z. KAŁUŻA, *Nicolas d'Autrécourt, ami de la verité*, [Histoire Littéraire de la France, 42/1], Paris: Académie des Inscriptions et Belles-Lettres – Institut de France, 1995, p. 195–198) — that the index at the end of the codex 6559 (f. 194v) provides the complete content of the *De sex*.

2. *Is a change of a luminous medium instantaneous and [takes place] in an instant?* (*Utrum alteratio medii luminosi* (corr. ex *luminosa*) *sit subita [et] in instanti*).

3. *Is an agent, while acting, a subject of action?* (*Utrum quodlibet agens* (corr. ex *alterans*) *in agendo repatiatur*).

QUESTION III

On motion of augmentation (*De motu augmentationis*): *Does a subject of augmentation continuously accelerate its movement in the process of augmentation?* (*Utrum augmentum continuum in augendo velocitet motum suum*).

ARTICLES:

1. *Is rarefaction possible?* (*Utrum rarefactio sit possiblis*).

2. *Is rarefaction a motion to some quantity?* (*Utrum rarefactio sit motus ad aliquam quantitatem*).

3. *Does rarefaction take place involving rarity and density?* (*Utrum rarefactio sit per rarum et densum*).

QUESTION IV

On local motion (*De motu locali*): *Can local motion be measured through a certain speed?* (*Utrum in motu locali sit certa servanda velocitas*).

ARTICLES:

1. *Is the speed of a heavy object motion caused by a certain factor?* (*Utrum velocitatio motus gravis sit ab aliqua causa certa*).

2. *Is the speed of a sphere moving [in time] measured by a point only or by a space?* (*Utrum velocitas motus spere cuiuslibet penes punctum tantum vel spacium aliquod attendatur*).

3. *Is acceleration of any uniformly difform local motion, starting from non-degree, equal to its middle degree?* (*Utrum velocitas omnis motus localis uniformiter difformis incipiens a non gradu sit equalis suo medio gradui*).

The *quaestiones* have a similar structure. Firstly, the author formulates the main issue and offers three solutions to the problem, then he employs six arguments against each of them. The next part of a question contains three articles starting with *Utrum…* and the original answer to them is negative (*arguitur primo quod non*): its justification consists of six *inconvenientia*. Then, in every article, there is a part *Ad oppositum* with the solutions of the given *inconvenientia* and, sometimes, the opinions of authorities that support the affirmative answer for

an article. In the last section of a question, *Ad questionem*, we can find reasonings solving only arguments against a position which, according to the author, is the correct one.[20]

The length and the level of complexity of the questions and articles are different. On some occasions, there are several, complex justifications of one *inconveniens*, on other occasions, the reasoning is very short; sometimes arguments are sophisticated, sometimes they are not very subtle, or the argument is quite elaborate and the answer to it — is not.[21] In any case, the author deals with plenty of examples and analyses, many of which are taken from other thinkers of the same

---

[20] The author does not always refer to each of the six arguments, sometimes he gives a general answer for the whole part containing *inconvenientia*. What is more, there can be more than one correct concept.

[21] In some answers to some *inconvenientia* the author does not indicate any mistake in reasoning, but he admits that the presented case itself is impossible, so in the very beginning the *inconveniens* is not valid. For example, this kind of answer is given for the second, the third and fifth *incoconvenientia* of the second article in the third question: f. 20vb: "Ad secundum dicitur negando casum…"; ibidem: "ad tertium dico similiter quod casus non est possibilis…"; 21ra: "Ad quintum dico quod casus non est possibilis…" It is true that this kind of answer is sometimes accompanied by a longer justification, but it still shows that the argument is not valid from the very beginning. What is more, to make a clear example of significant incoherence between the complexity a reasoning and the answer to it, we can cite, e.g. the first *inconveniens* to the third position from *De motu locali* (28v a–b): "Ad probationem primi inconvenientis arguitur sic. Sit *a* unum mixtum uniformiter difforme compositum equaliter ex gravi et levi, et sic situetur *a* quod pars magis gravis sit sub centro mundi. Sit *b* aliud mixtum uniforme cuius gravitas ad suam levitatem sit sicut gravitas *a* ad suam levitatem et equaliter compositum ex gravi et levi, sed ponatur *b* totaliter extra centrum mundi. Et sit medium circa <corr. ex citra> centrum equaliter resistens *a* et *b*. Et sequitur tunc conclusio quod *a* et *b* sunt duo mixta cuius proportio gravitatis *a* ad suam levitatem est tanta precise sicut proportio gravitatis *b* ad suam levitatem. Et *a b* ponuntur in eodem medio equaliter resistente sicut patet ex casu et *a* sufficit moveri in isto medio [et non *b*]. Quod si negatur, contra. *A* sic positum appetit moveri et non impeditur, igitur movetur. Assumptum probatur. Nam tota levitas in *a* ultra centrum appetit ascendere et tota gravitas in *a* citra centro appetit contingi (corr. ex contiguari) cum centro mundi; igitur omnia promoventia *a* quantum ad motum erunt sua gravitas citra centrum et levitas ultra centrum. Et nihil est impediens nisi solum levitas citra centrum, quia ponitur citius vacuum citra centrum vel quod se habeat ad medium extrinsecum in valde magna proportione maioris inequalitatis, igitur nihil est quod impedit ipsum *a* quantum ad motum nisi solum levitas citra centrum. Sed maior est proportio gravitatis in *a* citra centrum cum levitate in *a* ultra centrum ad movendum quam est levitas citra centrum ad resistendum, igitur ab ista proportione sufficit moveri, et ultra, igitur *a* sufficit moveri in isto medio et *b* non sufficit. Nam *b* est mixtum uniforme per totum, ita quod cuiuslibet partis *b* gravitas illius partis ad suam levitatem est sicut totius gravitatis *b* ad totam levitatem in *b*, sed totius gravitatis *b* ad suam levitatem est proportio equalitatis a qua proportione non est motus possibilis, nec *b* habet aliunde iuvamentum ad motum, igitur *b* non sufficit moveri in isto medio, igitur propositum." In this *inconveniens* the author refers to two *mixta* compounded in the same way and placed in the same medium and creates an interesting case, in which just the disposition in relation to the world's center is the cause of only one *mixtum* movement. There are two answers to this. The second one indicates that the conclusion is invalid as motion depends on the ratio of a moving power to its resistance *en bloc*, not on the pursuit of a component part of

philosophical milieu. The author explicitly refers, for example, to Thomas Bradwardine and William Heytesbury, expressing his appreciation for their considerations on motion,[22] but it seems that an important point of reference for him

a body. However, the first response regards a mistake in the construction of the reasoning itself, because it does not meet the criterion *ceteris paribus* ("all other things being equal"), necessary for comparing the analyzed situations in the proper way. Here is the fragment of the response I refer to (f. 39vb-40ra): "Dico quod conclusio non est inconveniens, sed possibilis et vera in casu supposito et causa est, quia c e t e r a n o n s u n t p a r i a. Nam licet *a* et *b* equaliter componantur ex gravi et levi, tamen inequaliter disponuntur et etiam inequaliter situantur. Modo et situs et dispositio bene iuvant ad motum. Si enim grave simplex poneretur in vacuo ymaginato circa centrum mundi, cuius quelibet pars esset extra centrum mundi, vel non moveretur, vel si moveretur, moveretur velocitate infinita. Sed si illud grave in vacuo ymaginato circa centrum mundi sic situaretur, ut minor pars eius foret sub centro, maior vero supra, idem grave tunc moveretur et hoc velocitate finita. Patet etiam in casibus communibus, quod dispositio bene iuvat ad motum, quare in casu supposito *a* habet quedam promoventia motum suum que nec qualia habet *b*. Et iam c e t e r a n o n s u n t p a r i a i n c a s u, ideo conclusio proposita non est inconveniens, sed est vera." This is one of several examples of ignoring the *ceteris paribus*. But not applying this rule means that actually there is no *inconveniens* to solve, taking into consideration the reasoning itself, since a careful reader can reject it immediately as not fulfilling basic conditions.

[22] For the significant dependence of the *De sex inconvenientibus* on William Heytesbury's work *Regulae solvendi sophismata*, or more precisely, on the sixth chapter of this treatise *De tribus praedicamentis*, see: S. Rommevaux-Tani, "La determination de la rapidité d'augmentation;" J. Papiernik, "Metody matematyczne w badaniach z zakresu filozofii przyrody," pp. 102–105. The content of some argumentations is clearly derived from W. Heytesbury's *opus*, but it does not mean that the anonymous author always accepts the solutions in the *Regulae*, he also opts for different attitudes to measuring motions. Thomas Bradwardine is mentioned in the anonymous treatise three times, in the fourth question. Firstly, while asking what the ways of measuring speed in local motion are, the author of the *De sex* presents, as usual, three approaches. It can be done by (1) the excess of the motive powers to the resistances, or (2) through the ratio of the motive powers to the resistances, or (3) through the ratio of the ratios of the motive powers to their resistances. He writes that the first two solutions are rejected by famous magisters — T. Bradwardine and A. Pyppelvelle (*De sex inconvenientibus*, f. 28rb-28va): "Et arguo primo quod non, quia ex isto tunc sequitur quod talis velocitas attenderetur penes excessus potentiarum moventium ad potentias resistentes, sicut ponit una positio, aut penes proportionem excessuum potentiarum moventium ad potentias resistentes, sicut ponit secunda positio, aut penes proportionem proportionum potentiarum moventium ad potentias resistentes, sicut ponit tertia positio. Prime due positiones demonstrative a pluribus improbantur, precise a duobus famosis: a magistro Thoma de Bradvardyn in tractatu suo *De proportionibus* et a magistro Adam Pippelvelle qui subtiliter hoc demonstrant. Nec tertia est ponenda, quia ex illa squuntur plura inconvenientia." Then, the third *inconveniens* in the second article of the fourth question regards Bradwardine's position, according to which motion of a sphere is measured by the supreme point on it. In this fragment one can find several arguments challenging this attitude (I do not quote them here because of their length, I just quote the passus containing Bradwardine's name; *De sex inconvenientibus*, f. 34rb): "Tertio ad articulum arguo sic. Si velocitas motus spere attenderetur penes aliquem eius punctum et constat quod non attenditur penes infimum vel medium, igitur velocitas motus spere cuiuslibet attendetur penes punctum supremum, et ista est positio magistri Thome de Bradvardyn in tractatu suo *De proportionibus*. Contra quam tamen arguo sic, quia ex illa sequitur tertium inconveniens adductum." Finally, the sixth *inconveniens* in the second article of the fourth question also

is also Richard Kilvington's work (even if he does not mention this name once): there are many arguments in the *De sex inconvenientibus* could be derived from Kilvington's *Quaestiones super Physicam*.[23] The anonymous thinker refers also to i.a. (apart from Aristotle and Averroes) Euclid, Petrus Peregrinus de Maricourt,

―――――――――

regards Bradwardine's position, according to which motion of a sphere should be measured by its fastest moving point, and here this approach is discredited as well (this argument is shorter, but nevertheless I quote only the part explicitly referring to Bradwardine). F. 35ra: "Sexto ad articulum. Si sic, igitur velocitas motus spere cuiuslibet maxime mote circa centrum suum attenderetur penes spacium lineale a puncto velocissime moto descripto vel penes spacia linealia a punctis velocissime motis in eodem tempore vel equali descripta, sicut tenet una opinio, et est positio magistri Thome de Bradvardyn, quam positionem reputo neccesariam et veracem, concordat tamen ista positio cum tertia, quas, ceteris abiectis, arbitror esse finaliter sustinendas. Contra quam tamen nihilominus arguo: si illa positio foret vera, sequeretur primo sextum inconveniens ductum contra articulum."

Despite his evident respect for W. Heytesbury and T. Bradwardine, the anonymous author does not see them as infallible authorities (as I mentioned above, some of Heytesbury's findings are discredited; Bradwardine's solutions are finally accepted, but before that they are challenged by several reasonings), as such he treats only Aristotle and Averroes — their points of view are conclusive in the *De sex* without any complex explanations. In several *Ad oppositum* parts, the opinions of Aristotle, of course with adequate comments of Averroes, are presented as irrefutable arguments against some *inconvenientia*.

[23] One of many examples of this dependence can be found in the sixth *inconveniens* of the first article in the first question. The reasoning presented here is in the first question of R. Kilvington's commentary to Aristotle's *Physics. De sex inconvenientibus*, f. 5ra–b: "Ad sextum inconveniens arguitur sic. Si terra pura tantum acquirat de loco quantum de forma, tunc cum haberet medietatem forme ignis in summo et foret equaliter gravis et levis, locabitur supra convexitatem aeris et supra magnam partem ignis ad punctum medium inter concavum orbis lune et centrum terre, et si ad idem punctum locabitur generatum, quando erit equaliter gravis et levis, ergo quando erit magis gravis quam levis, locabitur naturaliter in spera ignis, et ultra, igitur quando magis haberet de gravitate quam de levitate, quiesceret in concavo spere ignis." R. Kilvington, *Quaestiones super Physicam*, Venice, San Marco, lat VI, 72 (2810), f. 81 rb: "Item, si prima terra tantum acquireret de forma sicut de loco, tunc cum habebit medietatem forme et fuerit equaliter gravis et levis, locatur naturaliter supra convexitatem aeris et supra magnam partem ignis ad punctum medium inter concavum orbis lune et centrum terre quod est supra valde magnam partem ignis, ut sequitur ex dictis secundo *De generatione* ubi supponit <Aristoteles> quodlibet elementum superius esse decuplum ad elementum inferius sibi immediatum. Signetur ergo terra per unum, aqua per 10, aer <per> 100, et ignis per 1000. Tunc sequitur quod ex dicto Philosophi, quod ignis in sua spera excedit alia omnia tria elementa residua in maiori proporcione quam in millecupla qualis est proporcio 10 (corr. ex 9) ad 1 <tripla>; ergo punctus medius inter centrum <terre> et concavum orbis lune est supra valde magnam partem ignis. Ergo si <sic> ad illum punctum locabitur generatum quando erit equaliter grave et leve; quando erit magis grave quam leve, locabitur naturaliter in spera ignis supra magnam partem ignis."

Another example concerns the causes of the movement acceleration of a heavy body. There are some arguments in the anonymous treatise supporting the view that continuation of movement cannot be such a cause (in the second *inconveniens* in the first article of the fourth question, *De sex inconvenientibus*, f. 32rb): "Item, si sic, cum motus celi et orbium planetarum sit continuus, igitur celum cum ceteris orbibus velocitaret motum suum continue. Consequens falsum, igitur, etc. Item, si sic, cum motus horologii sit continuus, igitur motus talis esset intensior et intensior, et

Zahel, Albumasar, Jordanus de Nemore, which proves his erudition and enthusiasm for mathematics.

The entire work presents the application of logical and mathematical approaches to physical problems typical for the Oxford Calculators. It seems that the *De sex* is a compilation[24] of previous findings of the group of intellectuals, who started applying mathematics to the effects of different categories of motion, as the anonymous treatise rather summarizes these achievements than gives new solutions or original and in-depth considerations on the topics taken up by other members of the school. It presents the most important questions for the aforementioned milieu, including the justification for the mean speed theorem, which is seen as one of the most appreciated accomplishments in the

----

per consequens motus talis per tempus esset sensibilis motus valde. Item, sit aliquod grave quod eodem gradu velocitatis continueret motum suum, tunc, si continuatio talis motus esset causa velocitationis motus eiusdem gravis, sequitur quod aliquod grave continue velocitabit motum suum, et tamen nunquam acquiret gradum intensiorem motus quam prius. (…). Item, si sic, tunc hoc foret verum in casu quo duo gravia equalis virtutis descendunt in eodem medio, et unum incipit a loco superiori et aliud a loco inferiori adhuc, cum fuerint inequalia distantia a terra, non eque cito attingunt ipsam terram. Sed illud quod magis distat citius contingit terram, quod non foret verum, nisi maior continuatio motus illius quod sic plus distat, argueret maiorem velocitatem."

R. Kilvington employs the same arguments (for him, however, they prove that neither can continuation of movement be a cause of movement acceleration, nor can it be decreasing resistance nor approaching to a natural place). R. Kilvington, *Quaestiones super Physicam*, f. 86ra-b: "De illa velocitate motus gravis descendentis diversi diversas causas assignant. Quidam dicunt quod velocitas in suo descensu est propter minoritatem sue resistentie, et alii propter propinquitatem ad suum locum, et tertii propter continuationem sui motus, et quarti propter gravitatem actualem acquisitam, et quinti propter pulsum medii. Contra tres primas opiniones argui (f. 86rb) potest coniunctim per argumentum ultimo adductum. Ergo si duo gravia equalis virtutis descendant in eodem medio, et unum incipiat a loco superiori et aliud a loco inferiori adhuc cum fuerint in equali (corr. ex quasi) distantia a terra, non eque cito attingent ipsam, ut experimento notum est. Et ideo dicunt quidam, quod velocius movetur ista terra, que superius incipit moveri, quando iste due terre <in>equaliter distent a centro mundi. Et dicitur quod hoc est propter continuacionem motus. Ideo dicunt, quod non oportet talem motum velocitari in duplo, et in triplo, et in infinitum, quia continue medium sub ipso descendente plus condempsatur, ideo plus resistit equalis quantitati medii inferius quam superius."

A. Maier (*An der Grenze von Scholastik und Naturwissenschaft. Studien zur Naturphilosophie des 14. Jahrhunderts*, Essen: Essener Verlagsanstalt, 1943, p. 189–190) shows that some analyses of the *minoratio resiteniae* as a cause of motion in the *De sex* are similar to the ones present in *Quaestiones super Physicam* written by magister Ricardus, but she only quotes the response to the second *inconveniens*, not the reasoning itself contained in it. What is more, she assumes that magister Ricardus is the same person as Richard Swineshead, not Richard Kilvington.

[24] Such a character of the treatise is indicated by S. Caroti in his "Da Walter Burley," p. 368. To be more precise, the researcher does not present this opinion about the whole content of the work, he just concentrates on one issue, i.e. on the *reactio*, so this regards only the third article of the second question: "Utrum quodlibet agens in agendo repatiatur".

fourteenth-century science of motion.[25] The answer to almost every question in *quaestiones* and *articuli* is "yes"[26] and it seems that, according to the author, every movement can be measured, or better "measured", as the analyzed movements are not always compared to each other by ratios, and operations on numbers are not always used in arguments to solve a question or article. What is more, many considerations included in the treatise pertain to such aspects of movements that can be determined by simple logical tools or observations of the world. As a result, there is not always a need for measuring by numbers: maybe sometimes the more accurate verbs for expressing such procedures would be "to determine" or "to establish". This turns out to be obvious, when one takes into consideration what is the main subject of the analyses included in the work. They deal with

---

[25] On the mean speed theorem in Oxford scholars' works, see: M. CLAGETT, *The Science of Mechanics in the Middle Ages*, Madison: University of Wisconsin Press, 1959, Chapter 5: "The Merton Theorem of Uniform Acceleration," p. 255–329; E.D. SYLLA, "The Oxford Calculators' Middle Degree Theorem in Context," *Early Science and Medicine*, vol. 15 (2010), p. 338–370. However, the second author does not mention the *De sex inconvenientibus* and M. Clagett makes a relatively short remark about the treatise. Prof. Clagett (p. 264) is of the opinion that the proofs in this work are not worthy of analysis, as the anonymous author "is attempting to give the Merton arguments but (..) he does not have a very perceptive understanding of them." The employed reasonings, what is explicitly written by the researcher, are inadequate or shortened.

[26] In some cases, the author hesitates. For example, he presents reasonings in favor of the affirmative answer to the article "Utrum generans tantum loci contribuat quantum forme?," but also provides arguments which refute these reasonings. In the end, he writes that the authorities confirm such an answer and he explains how their opinion should be understood (the anonymous author refers to the 4th and the 32nd Averroes' comments to the Book VIII of the *Physics*; the 6th and the 23rd Averroes' comments to the Book IV of the *On the Heavens*; the 6th chapter of Albertus Magnus' commentary on Aristotle's *Meteors*; Al-Farabi's thought — without specific references). A *generans* cannot simply give from the place as much as from the form: the acquired form is the cause of movement towards the natural place for the body with a particular 'portion' of this form (f. 6vb): "Et ad auctoritates adductas consequenter respondetur, quod auctoritates sic habent intelligi, quod si generatum aliquid acquirit, tunc forma acquisita appetit locum proportionalem sibi et ad illum movetur nisi aliquid impediret, sed aliquando impeditur a medio propter densitatem eiusdem et in vacuo per formam contrariam, nam tam diu impedietur in pleno forma ignis ab ascensu quam diu forma terre erit fortior et intensior, sed quam cito dominabitur forma ignis super formam terre, tunc ascendit totum vel pars, deductis impedimentis, sicut patet de combustione ligni ex inflamatione olei." What is interesting, R. Kilvington also analyzes the problem and it seems that his answer is comparable with the cited above. R. KILVINGTON, *Quaestiones super Physicam*, f. 81vb: "Preterea, mixtum predictum tantum acquirens de loco quantum de forma semper est in loco suo naturali proporcionato illi mixto sub illo gradu, ergo in non instanti appetit locum superiorem per formam acquisitam, nec per formam acquirendam appetit alium locum, quia ista nondum est; ergo in nullo instanti appetit motum ad locum (*corr. ex* locum ad motum) superiorem, immo, ut videtur, in quolibet instanti temporis precedentis appetit quietem, ita quod non intendunt Philosophus et Commentator deducere impedimentum medii ad hoc quod motum de potentia essentiali acquirat tantum de loco quantum de forma <sicut est> de oleo inflamato, quia sicut partes inflamantur, ita proporcionaliter ascendunt. Et istud experimentum manifeste patet in aere et in medio resistente, ergo etc."

the causes and the rules for various movements. "Measuring" can still be the suitable term, if one understands it as, for example, the process (or the effect) of establishing what the factors influencing greater or lower speed are.

Different methods are used to determine movements and none of the methods seems to be particularly suitable for analyzing a specific type of movement, although it should be stressed that some are much more popular than others. The popularity of the specific methods can be easily evaluated: there are six *inconvenientia* related to each of three positions in each question and also six *inconvenientia* in connection with each of three articles within each question, so the number of presented cases and arguments to solve is quite impressive (even if the levels of their difficulty are uneven and their scheme, regardless of the kind of movement, is the same). Among the ways to determine speed, some of the least common arguments are the ones to which the observational facts are employed.[27] They seem especially useful as additional justifications for logical or mathematical reasoning. Other type of very rarely used ways of establishing speed is measuring by limits (in which the *maximum* or *minimum* of limits for active or passive potencies are taken in consideration). The most popular methods used in reasonings concerning the speed of movements are the ones in which the author employs: the processes of changing intensification of forms, i.e. latitudes of forms; calculus of ratios; analysis of the instantaneous speed; taking infinite speed as a point of reference for different movements; etc. In general, the thinker who composed this work shows that he is familiar with a wide range of ways of analyzing motions.

When it comes to the solutions of the four main questions, the author always presents three positions and accepts the third one. The movement of generation (the first question) should be measured by (3rd position) the latitude of the acquired form and only by it, not by (1st position) intensity of the gained form or by (2nd position) the gained form and the quantity of a subject that acquires this form[28]. In the case of the motion of alteration (the second question) the speed or slowness depends on (3rd position) the ratio of latitudes of forms'

---

[27] Of course, in constructing cases, the author often refers to the facts from the world, which can be easily observed, but he seeks justifications for the acceptance or rejection of the positions presented in them much more rarely.

[28] *De sex inconvenientibus*, f. 1ra: "Quarum prima est ista, quam ponunt diversi magistri quod velocitas et tarditas in generatione unius elementi ex altero attenditur penes formam inductam vel inducendam a generante, que sic intelligitur, quoniam generans inducit vel incipit inducere formam suam, ut verbi gratia in calefactione ubicumque inducitur forma ignis intensior, motus ille, quo ista forma [est] inducta, est velocior aliquo motu quo forma remissior inducitur. Secunda positio: quod velocitas generationis, qua unum elementum ex altero generatur attenditur penes latitudinem forme acquirende et penes quantitatem per quam extenditur ista latitudo illius forme acquirende, que sic intelligitur quod si sint due generationes equales, requiritur quod latitudines equales in equali tempore et per subiecta equalia acquirantur; et latitudo maior per maius

intensities (what is in accordance — according to the author — with Aristotle, Averroes and the whole "Oxford School"), not (1st position) on the degree of the acquired form's intensity or (2nd position) on the ratio of the size of subjects changed in the same time[29]. In the motion of augmentation (the third question) the speed is determined rather by (3rd position) ratio of latitudes of rarity, than by (1st position) the biggest quantity acquired by the whole or a part of a thing that undergoes the process of enlargement or (2nd position) by the ratio of quantity acquired *de novo* and the quantity previously possessed[30]. Finally, the local motion (the fourth question) can be measured primarily by (3rd position) the ratio of ratios of moving potencies and resistances, not by (1st position) moving potencies over resistances or by (2nd position) ratio of the excess of moving potencies over resistances[31]. As it is clearly seen, three accepted solutions concern the latitudes and the issue of *latitudo formarum* was very popular amongst the

---

subiectum et latitudo minor per minus. Tertia positio: quod velocitas generationis attenditur solum penes latitudinem forme acquirende, que sic intelligitur quod ubicunque due latitudines acquirentur uniformiter in tempore mensurante illos motus equaliter, illi motus sunt equales sive iste latitudines acquirantur subiectis equalibus sive inequalibus."

[29] Ibidem, f. 12ra: "...tunc talis velocitas vel tarditas attenderetur penes gradum inductum, ut ponunt diversi, et est positio plurimorum magistrorum famosa." Ibidem, f. 13rb: "Si velocitas in motu alterationis velocitas sit signanda, etc., igitur talis velocitas attenderetur penes proportionem quantitatum subiectorum in eodem tempore alteratorum (corr. ex alteratarum) sicut ponit secunda positio, quam reputo risu dignam cum prima." Ibidem, f. 14rb: "Si in motu alterationis velocitas sit signanda, etc., igitur talis velocitas attenditur penes proportionem latitudinum intensivarum sicut ponit tota scola oxoniensis et Atistoteles 7 *Physicorum* commento 71, et est illa positio quod proportio velocitatum in motibus alterationis sequitur proportionem latitudinum intensivarum."

[30] Ibidem, f. 22ra: "Velocitas talis augmentationis attenderetur penes maximam quantitatem quam acquirit totum auctum vel aliqua eius pars, sicut ponit una opinio et famosa plurimum magistrorum in artibus." Ibidem, f. 22va– 22vb: "si auctum continuum in augendo velocitet motum suum, igitur secundum aliam positionem talis velocitas attenderetur penes proportionem quantitatis de novo uniformiter acquirende in tanto tempore vel in tanto ad quantitatem prius habitam. Et illam positionem sustinet unus sollempnis magister potissimus et famosus Hethysbyry in suo tractatu capitulo de augmentatione." Ibidem, 23rb–23va: "...secundum aliam positionem velocitas in tali motu augmentationis attenditur penes proportionem latitudinum raritatis et ipsum velocius penes proportionem quantitatum linealium a punctis vel a puncto velocissime moto in tanto vel tanto tempore descriptarum."

[31] Ibidem, f. 28rb–28va: "...talis velocitas attenderetur penes excessus potentiarum moventium ad potentias resistentes, sicut ponit una positio, aut penes proportionem excessuum potentiarum moventium ad potentias resistentes sicut ponit secunda positio, aut penes proportionem proportionum potentiarum moventium ad potentias resistentes sicut ponit tertia positio. Prime due positiones demonstrative a pluribus improbantur, precise a duobus famosis, a magistro Thoma de Bradvardyn in tractatu suo *De proportionibus* et a magistro Adam Pippelvelle, qui subtiliter hoc demonstrant."

Oxford Calculators.[32] The preferred position from the last question is — what is *explicite* written — the one which is found in Bradwardine's work.

What is worth stressing, the *De sex inconvenientibus*, even if it repeats many of the considerations and solutions adopted by other Oxford Calculators, is not a simple record of achievements of the work of its predecessors. The anonymous author added several new problems connected to natural philosophy, deepened some already analyzed questions and referred to not only to Aristotle, Averroes or Euclid, but also to opticians, astronomers, geometers, experts in the science of weights and in magnetism. This evidently shows that the treatise not only provides a new interpretation of Aristotle's physics, but also contributes to the development of this discipline.

BIBLIOGRAPHY

ARISTOTELES, *Physica*, translatio vetus, edd. F. Bossier, J. Brams, Leiden – New York: E. J. Brill, 1990.

CAROTI, S., "Da Walter Burley al 'Tractatus de sex inconvenientibus'. La tradizione inglese della discussione medievale 'De reactione'", *Medioevo. Rivista di Storia della Filosofia Medievale*, vol. 21 (1995), p. 257–374.

CELEYRETTE, J., "Bradwardine's Rule: A Mathematical Law?," *Mechanics and Natural Philosophy before the Scientific Revolution*, ed. W.R. Laird, S. Roux, (Boston Studies in the Philosophy and History of Science, 254), Dordrecht: Springer, 2008, p. 51–66.

CELEYRETTE, J., MAZET, E., "Le mouvement du point de vue de la cause et le mouvement du point de vue de l'effet dans le 'Traité des rapports' d'Albert de Saxe," *Revue d'Histoire des Sciences*, vol. 56/2 (2003), p. 419–437.

CLAGETT, M., *Nicole Oresme and the Medieval Geometry of Qualities and Motions: A Treatise on the Uniformity and Difformity of Intensities Known as "Tractatus de configurationibus qualitatum et motuum"*, Madison: The University of Wisconsin Press, 1968.

CLAGETT, M., *The Science of Mechanics in the Middle Ages*, Madison: University of Wisconsin Press, 1959.

DUHEM, P., *Études sur Léonard de Vinci*, vol. 3, Paris: Hermann, 1913.

DUHEM, P., "La dialectique du Oxford et la Scolastique italienne," *Bulletin Italien*, vol. 12 (1912), pp. 6–26, 93–120, 203–223, 289–298.

---

[32] On this see especially E.D. SYLLA, "Medieval Concepts of the Latitude of Forms: The Oxford Calculators," *Archives d'Histoire Doctrinale et Littéraire du Moyen Âge*, vol. 40 (1973), p. 223–283.

Fernández Walker, G., "A New Source of Nicholas of Autrecourt's Quaestio: The Anonymous 'Tractatus de sex inconvenientibus'," *Bulletin de Philosophie Médiévale*, vol. 55 (2013), p. 57–69.

Jung, E., *Arystoteles na nowo odczytany. Ryszarda Kilvingtona "Kwestie o ruchu"*, Łódź: Wydawnictwo Uniwersytetu Łódzkiego, 2014.

Kałuża, Z., *Nicolas d'Autrécourt, ami de la verité*, (Histoire Littéraire de la France, 42/1), Paris: Académie des Inscriptions et Belles-Lettres – Institut de France, 1995.

Kilvington, R., *Quaestiones super Physicam*, Venice, San Marco, lat VI, 72 (2810).

Maier, A., *An der Grenze von Scholastik und Naturwissenschaft. Studien zur Naturphilosophie des 14. Jahrhunderts*, Essen: Essener Verlagsanstalt, 1943.

Maier, A., *Studien zur Naturphilosophie der Spätscholastik*, vol. 1: *Die Vorläufer Galileis im 14. Jahrhundert*, (Storia e Letteratura. Raccolta di Studi e testi, 22), Roma: Edizioni di Storia e Letteratura, 1949.

Oresme, N., *Tractatus de configurationibus qualitatum et motuum*, in: *Nicole Oresme and the Medieval Geometry of Qualities and Motions. A Treatise on the Uniformity and Difformity of Intensities Known as "Tractatus de configurationibus qualitatum et motuum"*, transl. and ed. M. Clagett, Madison: The University of Wisconsin Press, 1968.

Papiernik, J., "Metody matematyczne w badaniach z zakresu filozofii przyrody. Problem szybkości powstawania form w XIV-wiecznym traktacie 'De sex inconvenientibus'," *Przegląd Tomistyczny*, vol. 23 (2017), p. 95–145.

Polito, B., *"Questio de modalibus" Bassani Politi. "Tractatus proportionum introductorius ad calculationes" Suisset. "Tractatus proportionum" Thome Braduardini. "Tractatus proportionum" Nicholai Oren. "Tractatus de latitudinibus formarum" eiusdem Nicholai. "Tractatus de latitudinibus formarum" Blasii de Parma, Auctor "Sex inconvenientium"*, Venetiis: Bonetus Locatellus, 1505.

Rommevaux, S., "Six inconvénients découlant de la règle du mouvement de Thomas Bradwardine dans un texte anonyme du XIVᵉ siècle," *L'homme au risque de l'infini: Mélanges d'histoire et de philosophie des sciences offerts à Michel Blay*, ed. M. Malpangotto, V. Jullien, E. Nicolaïdis, (De Diversis Artibus, 93), Turnhout: Brepols Publishers, 2013, p. 35–47.

Rommevaux, S., "Un auteur anonyme du XIVᵉ siècle, à Oxford, lecteur de Pierre de Maricourt," *Revue d'Histoire des Sciences*, vol. 61/1 (2014), p. 5–33.

Rommevaux-Tani, S., "La détermination de la rapidité d'augmentation dans le 'De sex inconvenientibus': comparaison avec les développements sur le même sujet de William Heytesbury," *Miroir de l'amitié: mélanges offerts à Joël Biard*, ed. Ch. Grellard, Paris: Vrin, 2017, p. 153–162.

Sylla, E.D., "Medieval Concepts of the Latitude of Forms: The Oxford Calculators," *Archives d'Histoire Doctrinale et Littéraire du Moyen Âge*, vol. 40 (1973), p. 223–283.

Sylla, E.D., "The Oxford Calculators' Middle Degree Theorem in Context," *Early Science and Medicine*, vol. 15 (2010), p. 338–370.

HOW TO MEASURE DIFFERENT MOVEMENTS? THE 14TH-CENTURY TREATISE *DE SEX INCONVENIENTIBUS*

Summary

The anonymous treatise *De sex inconvenientibus* was written by an author who presumably belonged to the group of Oxford Calculators. This text is important in the history of the development of mathematical physics in the Late Middle Ages, as it can be considered a link between the achievements of the older Calculators and the compendium of knowledge of the whole group, i.e. the work of John Dumbleton. The four questions discussed in this text concern the speed in the process of generation (*De generatione*), motion of alteration (*De motu alterationis*), motion of augmentation (*De motu augmentationis*) and in the local motion (*De motu locali*). The paper presents the sources of the work and explains what are — according to the author of this work — the most adequate methods used in considerations on measuring speed in movements. It also demonstrates the profound dependence of the author on his predecessors who had earlier dealt with the issues concerning movements.